THE WIND EROSION PROCESS

The soil erosion process by wind forces is complex. The process involves the detachment, transport, sorting, abrasion, avalanching, and deposition of soil aggregates. Field conditions conducive to soil erosion include:

1. Loose, dry, and finely granulated soil;
2. Smooth soil surface with little or no vegetation present;
3. Sufficiently large area susceptible to erosion; and
4. Sufficient wind velocity to move soil.

Winds that are considered to be erosive are those with velocities that reach 13 miles per hour at a height of one foot above the soil surface. Considering the logarithmic wind profile this translates into a velocity of about 18 miles per hour at a 30 foot height. This is commonly referred to as the threshold wind velocity.

The wind transports primary soil particles and stable aggregates in three ways-saltation, suspension, and surface creep. These are illustrated in Figure 1, and discussed separately in the following paragraphs.

Saltation. Individual aggregates/particles ranging from 0.1 to *0.5* mm in diameter lift off the surface at an approximate 50 to 90 degree angle. The aggregates/particles then follow distinct trajectories under the influence of air resistance and gravity. The aggregates/particles fall back to the soil surface at impact angles of 6 degrees to 14 degrees from the horizontal. At the point of impact with the soil surface, the rebounding and embedded aggregates/particles initiate movement of other aggregates/particles. This has been commonly referred to as the "avalanching" effect. Most saltation occurs within 12 inches above the soil surface and typically, the length of the saltating trajectory is about 10 times the height. It has been suggested that from 50 to 80 percent of the total soil transport is by saltation.

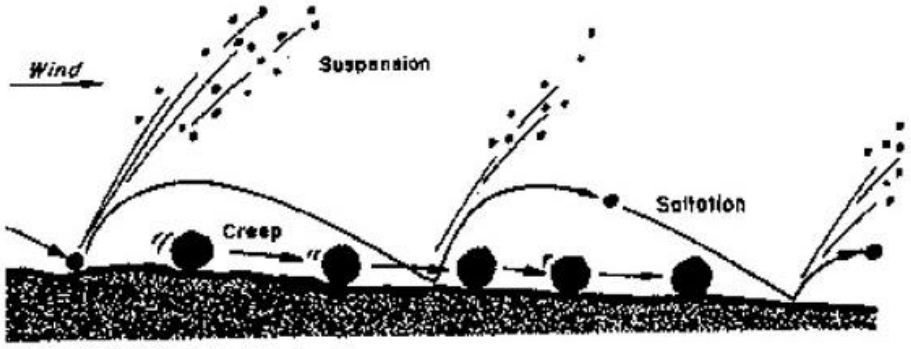

Figure 1. Wind Erosion Processes

Suspension. The finer particles, less than 0.1 mm in diameter, that are dislodged from an eroding area by saltation can be moved upward by diffusion and remain in the air mass for an extended period. Some suspension-sized particles are present in the soil, but many are created by abrasion during an erosion event. From 20 percent to more than 60 percent may be carried in suspension, depending on soil texture. As a general rule, suspension increases downwind, an on long fields can easily exceed the amount of soil moved in saltation and creep. Current research suggests that the range for suspension sized aggregates/particles can be divided into two categories-coarse *(0.05-0.1* mm) and fine (<0.05 mm).

Surface Creep. Sand-sized aggregates/particles are set in motion by the impact of saltating aggregates/particles. Under high winds, the whole soil surface appears to be creeping slowly forward as the aggregates are pushed and rolled by the flow. It has been noted that surface creep may account from 7 to 25 percent of total transport.